31. $P(t) = \dfrac{1000}{1+e^{4.8-0.7t}}$

$$\frac{M}{1+Ae^{-Mkt}}$$

$e^{4.8-0.7t}$

$e^{4.8} \cdot e^{-0.7t}$

a: $k = 0.7/1000$

carrying capacity $(M) = 1000$

b: $P(0) = \dfrac{1000}{1+e^{4.8-0.7(0)}}$ $\quad t = 0$

$P(0) = \dfrac{1000}{1+e^{4.8}} = 8.16$

8 rabbits

37a $\dfrac{232739.87}{1+14.582e^{-.1013x}}$

b 232739.87

c $225{,}000 = \dfrac{232739.87}{1+14.582e^{-.1013x}}$

$225{,}000 + 225{,}000 \cdot 14.582e^{-.1013x} = 232739.87$

$e^{-.1013x} = \dfrac{7739.87}{3280950}$

$x = \dfrac{\ln\left(\dfrac{7739.87}{3280950}\right)}{-.1013} = 59.719$ yrs

d $\dfrac{dP}{dt} = kP(M-P)$

$-k = \dfrac{-.1013}{232739.87}$

$k = 4.35 \times 10^{-7}$

$kP(232739.87 - P)$

$(4.35 \times 10^{-7})P(232739.87 - P)$

$B(t) = 26.7(1.036)^t$

$\int 26.7(1.036)^t \, dt \rightarrow 26 \int (1.036)^t \, dt$

$F(x) = \frac{1.036^t}{\ln(1.036)} \cdot 26 + C$

$\frac{1.036^{15}}{\ln(1.036)} \cdot 26 - \frac{1.036^0}{\ln(1.036)} \cdot 26 = 528.3$ +1

$756 + 528 = \boxed{1{,}284}$

b) $\frac{528.3}{15} = 35.22$ or $\boxed{35 \text{ bison/yr}}$ +1

(2) (a) $\int_{-2}^{2} 4-x^2 \to F(x) = 4x - \frac{x^3}{3} + C$

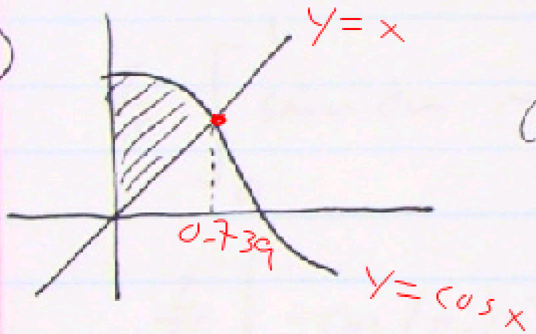
+1 → approx.

+1 → def. int.

$$4(2) - \frac{(2)^3}{3} - \left(4(-2) - \frac{(-2)^3}{3}\right)$$

$$8 - \frac{8}{3} + 8 - \frac{8}{3} \Rightarrow 16 - \frac{16}{3} \approx \frac{32}{3} \approx \boxed{10.66}$$

(b) +2



cos x = x

cos x − x = 0

x ≈ 0.739

$$\int_0^{0.739} \cos x - \frac{1}{2}(0.739)(0.739) \approx \boxed{0.401}$$

↓

$$\sin 0.739 - \sin 0 - \frac{1}{2}(0.739)^2$$

(3) $y = 3x^2\sqrt{x^3+1}$, $[0, 2]$

$$\text{av} = \frac{1}{2-0}\int_0^2 3x^2\sqrt{x^3+1}\,dx \rightarrow u = x^3+1 \quad du = 3x^2\,dx$$

+2

$$\frac{1}{2-0}\int_0^2 u^{\frac{1}{2}}\,du \rightarrow F(x) = \frac{2}{3}\left(\sqrt{x^3+1}\right)^3$$

$$\frac{1}{2}\left[\frac{2}{3}\left(\left(\sqrt{2^3+1}\right)^3 - \left(\sqrt{0^3+1}\right)^3\right)\right] = \boxed{8\tfrac{2}{3}}$$

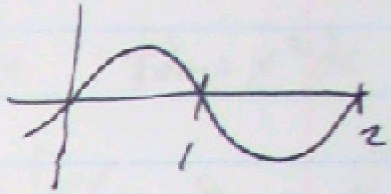
(4)

$v(t) = \sin \pi t \qquad 0 \le t \le 2 \qquad P = \frac{2\pi}{b} = 2$

so neg on $[1, 2]$

$2 \int_0^1 \sin(\pi t)\,dt \rightarrow u = \pi t \qquad du = \pi\, dt$

$\frac{du}{\pi} = dt$



two bumps

$\frac{2}{\pi} \int_0^1 \sin u\, du \rightarrow F(x) = -\cos u + c$

$\frac{2}{\pi}\left[-\cos(\pi \cdot 1) - -\cos(\pi \cdot 0)\right] = \boxed{\frac{4}{\pi}}$

$1 + 1$

2 – A

1.5 – B

1 – C

0.5 → glimmer

0 – blank

5

a

$$\int \frac{2x}{x^2+1}\,dx \qquad u = x^2+1 \qquad du = 2x\,dx$$

$$\int \frac{1}{u}\,du \rightarrow \ln u + c \rightarrow \boxed{\ln|x^2+1| + C}$$

b

$$\int \frac{6x^2+10}{x^3+5x}\,dx \qquad u = x^3+5x \qquad du = 3x^2+5\,dx$$

$$\int 2\,\frac{1}{u}\,du \rightarrow 2\ln u + c \rightarrow \boxed{2\ln|x^3+5x| + c}$$

(c) $\int_0^2 x^2(x^3+1)^{3/2}\,dx \rightarrow u = x^3+1, \quad du = 3x^2\,dx, \quad \frac{1}{3}du = x^2\,dx$

$\frac{1}{3}\int_0^2 u^{3/2}\,du \rightarrow F(x) = \frac{1}{3}\left(\frac{2}{5}u^{5/2}+c\right) \rightarrow \frac{1}{3}\left[\frac{2}{5}\left((2^3+1)^{5/2} - (0+1)^{5/2}\right)\right] \approx \boxed{32.2\overline{66}}$

(d) $\int_0^{\frac{\pi}{6}} \sin(2x)\cos(2x)\,dx \rightarrow u = \sin 2x \quad du = 2\cos 2x\,dx \quad \frac{1}{2}du = \cos(2x)\,dx$

$\frac{1}{2}\int_0^{\frac{\pi}{6}} u\,du \rightarrow F(x) = \frac{1}{2}\left(\frac{1}{2}u^2+c\right)$

$\frac{1}{2}\left(\frac{1}{2}\sin^2(2\cdot\frac{\pi}{6}) - \frac{1}{2}\sin^2(2\cdot 0)\right)$

$\frac{1}{2}\cdot\frac{1}{2}\cdot\left(\frac{\sqrt{3}}{2}\right)^2 - 0 \rightarrow \frac{1}{2}\cdot\frac{1}{2}\cdot\frac{3}{4} = \boxed{\frac{3}{16}}$

4 → A
3 → minor errors
2 → conceptual
1 → pretty messed up

Chapter 6 Review

Do #1-18 (Not 9, 10)